ABSTRACT

GENDER DIFFERENCES IN INTERACTIVE TOY USE FOR LITERACY DEVELOPMENT

by Deanna Marie Strigens

Research has suggested gender differences in the area of literacy skill development. The educational links between literacy and technology have recently been discussed. The current study examined the gender differences in literacy development for boys and girls who use the PowerTouch™ interactive toy in Head Start preschool classrooms. Several findings support the established research. Limitations are discussed.
GENDER DIFFERENCES IN INTERACTIVE TOY USE FOR LITERACY DEVELOPMENT

A Thesis
Submitted to the
Faculty of Miami University
in partial fulfillment of
the requirements for the degree of
Educational Specialist
Department of Educational Psychology
by
Deanna Marie Strigens
Miami University
Oxford, Ohio
2006

Advisor: _______________________________
Doris Bergen, Ph.D.

Reader: _______________________________
David Shriberg, Ph.D.

Reader: _______________________________
Paula Saine, Ph.D.

Reader: _______________________________
Katherine McMahon-Klosterman, Ph.D.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Abstract</th>
<th>i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1: Introduction</td>
<td></td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>3</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>6</td>
</tr>
<tr>
<td>Limitations</td>
<td>7</td>
</tr>
<tr>
<td>Chapter 2: Review of the Literature</td>
<td></td>
</tr>
<tr>
<td>Research on Literacy Skills</td>
<td>8</td>
</tr>
<tr>
<td>Gender Differences in Literacy Skills</td>
<td>9</td>
</tr>
<tr>
<td>Gender Differences in Toy Use</td>
<td>12</td>
</tr>
<tr>
<td>Gender Differences in Technology Use</td>
<td>13</td>
</tr>
<tr>
<td>Linking Technology and Literacy</td>
<td>15</td>
</tr>
<tr>
<td>Purpose of the Study &amp; Hypotheses</td>
<td>18</td>
</tr>
<tr>
<td>Chapter 3: Method</td>
<td></td>
</tr>
<tr>
<td>Participants</td>
<td>19</td>
</tr>
<tr>
<td>Materials</td>
<td>20</td>
</tr>
<tr>
<td>Procedures</td>
<td>22</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>25</td>
</tr>
<tr>
<td>Chapter 4: Results</td>
<td></td>
</tr>
<tr>
<td>Hypothesis One</td>
<td>26</td>
</tr>
<tr>
<td>Hypothesis Two</td>
<td>27</td>
</tr>
<tr>
<td>Hypothesis Three</td>
<td>27</td>
</tr>
<tr>
<td>Hypothesis Four</td>
<td>28</td>
</tr>
<tr>
<td>Hypothesis Five</td>
<td>28</td>
</tr>
<tr>
<td>Hypothesis Six</td>
<td>29</td>
</tr>
<tr>
<td>Hypothesis Seven</td>
<td>29</td>
</tr>
<tr>
<td>Post Hoc Results</td>
<td>29</td>
</tr>
<tr>
<td>Chapter 5: Discussion</td>
<td></td>
</tr>
<tr>
<td>Study Design Based on Contemporary Literature</td>
<td>34</td>
</tr>
<tr>
<td>Other Findings</td>
<td>35</td>
</tr>
<tr>
<td>Limitations</td>
<td>36</td>
</tr>
<tr>
<td>Recommendations for Future Research</td>
<td>38</td>
</tr>
<tr>
<td>Summary and Conclusions</td>
<td>39</td>
</tr>
<tr>
<td>References</td>
<td></td>
</tr>
<tr>
<td>Appendix A: Teacher Letter</td>
<td></td>
</tr>
<tr>
<td>Appendix B: Parent Letter</td>
<td></td>
</tr>
<tr>
<td>Appendix C: Informed Consent</td>
<td></td>
</tr>
<tr>
<td>Appendix D: Parent Questionnaire</td>
<td></td>
</tr>
<tr>
<td>Appendix E: Session Protocols</td>
<td></td>
</tr>
<tr>
<td>Appendix F: Observation Sheet/Fidelity Checklist</td>
<td></td>
</tr>
</tbody>
</table>
FIGURES

Figure 4.1 Table: TERA:3 Reading Quotient Pre- and Post-Test Descriptive Statistics Between Experimental Conditions 17

Figure 4.2 Table: Reading Quotient Pre- and Post-Test Descriptive Statistics by Gender and Experimental Condition 19

Figure 4.3 Graph: Time Spent in Reading Acts by Experimental Condition 21

Figure 4.4 Graph: Percent of Time Spent in Reading Acts by Experimental Condition and Gender 22

Figure 4.5 Table: Post Subtest Descriptive Statistics by Gender and Experimental Condition 23
Gender Differences in Interactive Toy Use for Literacy Development

Chapter I: Introduction

Literacy may be considered one of the most critical topics in the field of early education. A child’s ability to read predicts countless educational outcomes, among other social and economic outcomes later in life. Promoting early literacy development in children is essential to ensure their success.

Literacy can be defined as a psycholinguistic process involving several subprocesses such as letter recognition, phonemic awareness, and computation of sentence meaning. Literacy can also be socially defined as the practice of meaning construction with distinct characteristics among different groups (August & Hakuta, 1997). Both definitions assume that participation in a community that uses literacy and exposure to literacy through oral reading and instruction foster the development of this set of skills.

Research has suggested gender differences in the area of literacy skill development. Girls have shown to score significantly higher in the areas of reading and literacy, while boys are over-represented in remedial reading programs (Vogel, 1990). In addition, research suggests that girls have a higher proportion of literacy experiences available to them at home (Millard, 1997). Gender differences in toy preference and technology use have also been discussed in the literature (Alexander, 2003; Roopnarine, 1986; Shade, 1994).

The educational links between literacy and technology have recently been discussed. Baker (2003) examined the explosion of educational software and technology that claim to enhance literacy skills. Storybooks are being coupled with interactive, technology-enhanced toys to promote early literacy development in young children.

Preschool is a particularly critical time for literacy skill acquisition. According to the data from the 1993 National Household Education Survey, the percentage of children displaying signs of emerging literacy and small motor skills increased with age within the 3- to 5-year-old population (Powell, 1995). In this way, preschool makes for a developmentally appropriate time to present literacy based instruction and promote emergent literacy.
Purpose

The discrepancy between girls and boys’ early literacy skills along with the differences in technology use and preference suggest a need for research in the area of interactive technology-enhanced literacy toys. The current study will examine the gender differences in literacy development for boys and girls who use the PowerTouch™ interactive toy in Head Start preschool classrooms.

Hypotheses. Based on the literature, it is hypothesized that:
(1) After exposure to the Power Touch™, both boys and girls will gain literacy skills.
(2) There will be a larger gain in literacy skills for girls than boys.
(3) There will be a difference in duration of time spent using the interactive toys between boys and girls.
(4) There will be a relationship between time spent and gains made in literacy skills.
(5) There will be a relationship between time spent engaged in literacy related activities at home and gender of the child.

Limitations

Limitations of this research as well as suggestions for future research will be discussed at the conclusion of this thesis. Attrition due to loss of transportation, limited time spent in experimental session, and lack of external validity of the materials used are among some of the limitations further discussed.
Chapter II: Review of Literature

This review discusses the gender differences in acquisition of literacy skills in children. Both achievement differences and experience differences are discussed. Gender differences in both toy and technology use are also discussed. Finally, this review links literacy, gender, toy use, and technology, and discusses tools that have been used to promote literacy development in all children.

Research on Literacy Skills

In order to learn to read, children must learn specific literacy skills that enable them to decode and encode words. These involve metalinguistic skills, such as breaking a word into component sounds (phonemic awareness) and recognizing letters and the sound each of them "makes" (sound-to-symbol correspondence). Children must learn to visually discriminate between different letters and how to form these letters when they write. They also must learn to recognize certain words visually (sight words) and how to decode others (phonics). By the end of early childhood, children begin to learn some of the spelling rules that will facilitate writing in later grades. Finally, children must learn specific reading strategies that help them to figure out unknown words or the meaning of a complicated sentence.

Phonemic and phonological awareness are especially important keys to reading success for children. Phonological awareness is the awareness that language is composed of sounds and the understanding of the relationship of these sounds (words in sentences, syllables, and rhyming). Phonemic awareness can be defined as the ability to perceive, manipulate, and think about these sounds in language while connecting them to letters. Children who are phonemically aware can identify sounds that are the same and different, substitute one sound for another, omit a sound, segment a word into discrete sounds, and blend discrete sounds together to pronounce a word.

Research has consistently demonstrated the strong relationship between phonemic awareness skills and reading achievement in children (Snow, Burns, & Griffin, 1998). In order for children to grasp the alphabetic principle and make the critical connection between sound and print, they must first become familiar with the sounds that make up the language, thereby becoming phonemically aware. According to research by Lundberg, Frost, and Peterson (1988), children who develop phonemic awareness by
kindergarten become significantly better readers and spellers in the first and second grade.

Gender Differences in Literacy Skills

Achievement Differences. Among the many issues that relate to gender, the ongoing disparity between boys and girls in relation to academic success is a widely discussed one. Performance in reading and literacy is of particular concern. Lummis and Stevenson (1991) found that girls achieved significantly higher scores than boys for reading in kindergarten and first grade. According to a national survey, more 3- to 5-year old girls than 3- to 5-year old boys demonstrated emerging literacy skills, such as identifying primary colors, recognizing letters, counting to 20, pretending to or reading stories, and writing their own name (Powell, 1995).

The literature suggests a clear concern for the underachievement of boys when it comes to reading. Vogel (1990) has shown a high ratio of boys to girls (4:1) in learning disability programs. There also are reportedly significantly greater numbers of boys than girls in remedial reading classes (Alloway & Gilbert, 1997). In a longitudinal study, a systematic relationship was found between gender and reading categorization in grades one through three, with more boys below average (Phillips, Norris, Osmond, & Maynard, 2002).

Literacy tests in the primary years invariably show boys behind girls, and boys’ poor performance in tests like these was one of the main arguments used for mounting the New South Wales Inquiry into Boys’ Education in 1994 (O’Doherty, 1994). The inquiry noted the various ways in which boys were significantly over-represented in special language and reading classes. Of 317 children identified with serious language disorders in the New South Wales Department of Education, 256 were boys and three times more boys than girls were receiving special assistance in school for reading.

The issue does not end in the primary years. Boys’ poor performance and participation in secondary school English and literature subjects, and their absence from the humanities and the arts areas has been documented in the national report, Who Wins at School? Additionally, data from national literacy testing in Australia indicates that 34% of boys at age nine are without ‘basic literacy skills’, as compared to 26% of girls at the same age (Alloway & Gilbert, 2002).
Experience Differences. Some strategies have been implemented to promote emergent literacy in young children. Justice and Pullen (2002) suggest using storybooks to promote early literacy skills in at-risk preschoolers. They posit storybooks as socially-embedded opportunities for interacting with the oral and written structure of oral language. Additionally, these types of interactions provide highly contextualized, meaningful, and scaffolded exposures. Masny (1996) suggests that, in preschoolers, language skills most apt to develop literacy are those related to print and oral skills.

Engaging in storybook reading with a child has long been thought to be an important means of fostering literacy acquisition. More specifically, it is the dialogue about the book being read that is considered at least as important as the actual reading of the text. Theorists have suggested that discussion about a shared book may focus children’s attention on the sound structure of words and the relation between letters and sounds, make them more aware of the functions of print, and facilitate story understanding (Sonnenschein & Munsterman, 2002). This incorporates the acquisition of phonemic awareness into the reading experience.

Children’s experiences with reading and exposure to pre-literacy skills may vary in relation to gender. Gender role stereotyping continues to be one of the most consistent domains in which adults, particularly parents, play an important role in children’s socialization (Campenni, 1999; Idle, Wood, & Desmarais, 1993; Lytton & Romney, 1991). Millard (1997) concludes that early literacy experiences in the home differ between boys and girls. Girls seem to have more literacy experiences available to them. Additionally, female adults are more likely than male adults to promote literacy experiences with children.

In a study measuring at-home reading activities with mothers and their children, Tracey and Young (2002) found the girls spoke significantly more during the at-home reading conversations than did boys. Additionally, mothers of girls spoke significantly more during the conversations than did mothers of boys. Greater verbal involvement by children during parental storybook reading has been linked with increased levels of vocabulary development and story comprehension (Snow, 1983).

Early childhood experiences affect many domains of the child’s life. Child care is a context where aspects of societal organization - like differential status associated with
gender - can shape children’s daily experiences (Howard & James, 2000). Findings about these differences can provide guidance when determining educational practice. For example, Tonyan & Howes (2003) suggest that if children of one gender spend less time in certain cognitively enriching activities than children of the other gender, then researchers and teachers may want to consider ways that teachers can more effectively encourage children of that gender to participate in those enriching activities. Specifically, their research suggests exploring why language arts activities available in the classroom may be more attractive to girls than to boys.

**Gender Differences in Toy Use**

Children’s growing knowledge about what boys and girls like and how they differ influences their own interests and behavior. An area in which gender differences emerge is toy use. Stereotype knowledge about concrete items such as toys emerges at about the age of three. Gender related toy preference appears as early as 1 year (Roopnarine, 1986) and is usually found by the age of 2 (Weinraub, Clements, Sockloff, Ethridge, Gracely & Meyers, 1984). Once children are exposed to the gender-labeling of something, their behavior toward it often changes to match expectations. Research conducted by Lam & Leman (2003) suggests that children utilize what notions they have about gender (schemas) as ways of making predictions for themselves and others when making decisions about toy choice. Once again, the early influence of parents is extremely important and highly affects toy preference (Caldera, Huston, & O’Brien, 1989). Play provides contexts for parents to share their knowledge and expectations regarding gender-appropriate behavior (Campenni, 1999).

The gender differences in toy preferences that exist throughout much of childhood appear to further gender differences in cognitive and social development (Alexander, 2003). Most children prefer playmates of the same sex and with compatible play styles, and these preferences result in same sex groupings (Alexander & Hines, 1994). Over time, these groupings promote gender specific social interaction patterns (Maccoby, 1998).

**Gender Differences in Technology Use**

Research suggests there are significant differences in males and females on technology use, as well. Gender seems to have an effect on computer attitude. Although...
female students have shown to be equally aware of the importance of technology and computers and to be equally capable of learning computer related skills, they have been found to be less likely to work or play with computers when allowed (Lim, 2002). Models of computer use by parents portray images that bombard children at home as well. Boys are more likely to make use of computers at home, and both boys and girls identify their fathers as the computer users in their families even when both the mother and father use computers at home (Margolis, Fisher, & Miller, 2000). A study of students (K-12) measuring attitudes of and perceptions of gender appropriateness of common activities, including computer use, concluded that boys and girls alike perceive the computer to be more appropriate for boys than for girls and boys’ attitudes toward the computer were more positive (Wilder, Mackie, & Cooper, 1985). The same survey also showed that writing activities were seen by all students at all grade levels as more appropriate for females than for males.

This gender gap in computer use starts as early as preschool and kindergarten (Shade, 1994). Following Skeleton’s (1989) research attempting to discover the reasons behind the clear differences in subject choice at thirteen, Whyte (1983) states,

> It is unlikely that these crucial differences between the sexes suddenly made their appearance at the age of 13. Their roots are to be uncovered in different patterns of growth in the primary school and in particular in the way that school prepares children for adult life. (p. 8)

These differences in computer anxiety and negative computer attitudes appear to be based on perceived gender-roles rather than biologically based. The research previously cited supports the notion that technology is masculinised and gender imbalances are a result of socialization. In comparison, psychological gender differences are not found in situations in which technology use is not linked with gender, such as in single sex schools (Brosnan, 1998).

The literature on gender and computing supports the assertion that academic performance is adversely affected by negative attitudes toward the computer (Munger, 1989). Additionally, perceptions of gender roles in mathematics and science are related to similar attitudes in using computers (Gripshover, 1984). Work by feminist researchers has demonstrated that technological competence and expertise are associated with the
masculine (Stepulevage, 2001). Research has shown that software and computer interaction has traditionally favored images that appeal to boys (Ellsworth & Whatley, 1990). Volman & ten Dam (1998) suggest computing is used to shape gender identity, with girls ‘practicing’ computer inexperience in the classroom. Among their peers, girls who become interested in computers are often ostracized by their female peers, as well as boys, who are often unwilling to grant girls the coveted “hacker” status (Upitis, 1998).

Many hypotheses have been made as to the direct cause of this lack of computer confidence in girls. The UK National Council on Education Technology (NCET) contributes the following factors in their 1996 study, Attracting Girls to IT:

Girls are likely to take on more passive roles when working alongside boys. Lack of access to role models, lack of awareness on the part of career advisers and teachers, inflexible employers, poor recruitment practices, lack of parental and social encouragement....aggressive computer games and many more factors have been blamed (NCET, 1996, cited in Opie, 1998). (p. 87)

**Linking Technology and Literacy**

Technology is constantly changing the everyday life of society and has had a significant impact on educational techniques and methods. Technology competence is considered to be a new basic of education (Kenway, 1996). There is an explosion of educational software and web pages that claim to enhance literacy and technology (Baker, 2003). Rather than serving as a supplementary tool, computer use is becoming the norm. According to Morgan (2001), basic skills of accuracy in grammar, spelling and reading comprehension, while still important, are insufficient, and must be supplemented by newer forms and practices of literacy. Millard (1997) suggests,

Parents and educators have perhaps been too ready to dismiss children’s engagement with computers as a diversion from their own preferred book-based literacy. Perhaps they have failed to see the relevance of it, its benefit and its preparation for the future. (p. 39)

**Computer Programmed Toys.** Another way of linking printed storybooks and technology is through interactive toys developed by manufacturers to promote literacy
skills in preschoolers. Many of these toys involve “finger-point reading”, a technique in which children synchronize vocalizations with individual printed words. Success with this voice-to-print match is associated with success in phoneme segmentation and invented spelling (Uhry, 2002). Morris (1983) measured phoneme awareness using invented spelling. He found that the ability to segment an initial phoneme and to associate it with a printed letter provides a child with control over the match between voice and print. Invented spelling has shown to predict later reading as it incorporates letter knowledge and phoneme awareness (Share, Jorm, Maclean & Matthews, 1984).

Lewin (1998), suggests that Talking Book software is successful at providing supplementary practice for beginning readers. Such practice, according to her research, positively affects sight word acquisition. In another study, Lewin (1997) describes how the incorporation of sound technology provides for the association of the spoken word with its written form, providing positive and constant reinforcement. This type of design is intended to encourage the beginning reader to take note of visual and phonic cues. Lewin also points out that interactive software allows the beginning reader to control the pace at which they proceed and take responsibility for their own learning.

There are currently two main leaders in the interactive toy industry. LeapPad® is an interactive toy using a platform that is designed to provide extra practice in phoneme segmentation and blending in the context of real stories (www.leapfrogschoolhouse.com). It is a tool for giving feedback and self-correction, and thus claims to promote self-teaching. The incorporation of age-appropriate stories attempts to provide a meaningful learning experience. The designers assert that through these types of experiences children gain the optimal level of exposure and practice needed to become fluent readers. To date there has been no completed research to substantiate these assertions.

In July 2003, Fisher-Price launched the PowerTouch™ Learning System to address similar objectives. This system uses the “finger-point reading” method to allow children to learn reading skills by simply touching words and pictures with their fingers. PowerTouch™ Learning System incorporates more than sixty activities in reading, phonics, spelling, music, math, along with an interactive alphabet board built into the base of the system (www.bestbooks.biz/children/power-touch.htm). Again, there has
been no published research as to the effectiveness of the toy in reaching these proposed objectives.
Purpose

Most research indicates a discrepancy between girls and boys’ early literacy skills, suggesting a lack of interest in “reading-like” activities in boys. In contrast, the literature suggests an attraction, for boys in particular, to computer activities. Interactive technology enhanced literacy toys may bridge this gap, attracting boys for the computer-like aspects of the interactive toy, and girls for the reading-like aspect. However, there is a need for more research investigating the usefulness of technology enhanced interactive literacy toys for both boys and girls.

The current study examined the gender differences in literacy development for boys and girls who use the PowerTouch™ interactive toy in Head Start preschool classrooms.

Hypotheses. Based on the literature, it is hypothesized that:

1. There will be a difference in TERA:3 scores between participants in the technology condition and participants in the books only (control) condition.
2. There will be a difference in the amount of time spent between participants in the technology condition and participants in the books only condition.
3. After exposure to the Power Touch™, both boys and girls will gain literacy skills.
4. There will be a larger gain in literacy skills for girls than boys.
5. There will be a difference in duration of time spent using the interactive, technology-enhanced toys between boys and girls.
6. There will be a relationship between time spent and gains made in literacy skills.
7. There will be a relationship between time spent engaged in literacy related activities at home, as reported by parents, and gender of the child.
Chapter III: Method

Participants

The sample of participants was taken from preschool classrooms in the Head Start program in a suburban district in the mid-west. Although 63 participants initially existed in the sample, the population was reduced to 41 subjects (25 girls and 16 boys). This drastic reduction in sample size was primarily due to a loss in transportation for the students. Bussing for the preschool was removed toward the end of the experiment. Many of the children previously enrolled in Head Start at the start of the experiment withdrew when transportation was removed.

Head Start is a federally funded low-income program. Each child had previously been enrolled in a Head Start classroom in the fall of 2004. The ages of the children ranged from three to five-years old. All of the students were members of families within a socioeconomic range making them eligible for Head Start. Approximately one third of the sample was primarily Spanish-speaking students enrolled in the Head Start program. A letter describing the experiment was distributed to teachers in participating classrooms (see Appendix A).

Informed consent was gained from the parents of the participants as well as verbal assent from the participants themselves (see Appendices B and C). After consent was obtained, an experimental method was used, and each participant randomly assigned to an experimental condition stratified to maintain equivalency of gender, ethnicity, and classroom membership between conditions.

Participants were divided into a control group, consisting of 23 subjects, and an experimental group, consisting of 18 subjects. Children assigned to the experimental group were exposed to the interactive, technology-enhanced Power Touch™ literacy system, along with the books that accompany the system. Children in the control group were exposed to the Power Touch™ books only during experimental conditions.

A sub-sample of the children recruited for this research were used in supplemental research investigating differences in literacy development between English and Spanish speaking preschoolers. This sub-sample made up 13 of the 41 participants and consisted of children living in homes in which Spanish was the primary language. Noteworthy results from this sub-sample will be addressed in the discussion section of this document.
Materials

Fisher-Price Power Touch™. Twenty Fisher-Price Power Touch™ interactive literacy systems were used with participants in the experimental condition. Each technology-enhanced system included five Power Touch™ story books including Sesame Street, Ernie’s Neighborhood, Clifford, Blues Clues, and Dora the Explorer. These systems were donated from Fisher-Price to be used in researching their technology enhanced literacy system. At the conclusion of the study, the literacy systems were donated to the participating Head Start classrooms.

Non-Interactive Literacy Books. Non-interactive literacy books were available to the participants in the books only condition for the same duration that the interactive literacy system was presented to the participants in the technology condition. These non-interactive items will consist of the books that are included in the PowerTouch™ system, including Sesame Street, Ernie’s Neighborhood, Clifford, Blue’s Clues, and Dora the Explorer. The books were used without the interactive base, providing no reinforcement or interactive technology. The experimenters spent equivalent amounts of time with both groups of participants.

TERA-3. To assess literacy skills, the Test of Early Reading Ability-Third Edition (TERA:3) was used. Participants in both conditions were administered the TERA:3 as a pre-test in October, prior to the intervention. Although Spanish versions of the TERA:3 are available, it was administered in English to all participants as the skills being measured are all related to performance within an English-speaking environment. The TERA:3 was used again in January as a post-test.

The TERA:3 is a direct measure of the reading ability of young children. It assesses mastery of the alphabet, the conventions of print, and the construction of meaning from print. The TERA:3 is appropriate for use with children from 3.6 to 8.6 years of age. The TERA:3 is generally used to identify candidates for early reading intervention, identify strengths and weaknesses, and monitor changes in performance due to intervention. The test was last normed in 2000 (n=875) and stratified by age relative to geography, gender, race, residence, and ethnicity. New studies show the absence of gender, racial, disability, and ethnicity bias. Reliability coefficients in 30 of the 32 reported are consistently high, all exceeding .90. New items have been added to
this edition to reduce ceiling and floor effects for the upper and lower ages. According to
the test publisher, the TERA:3 has validity for the general population as well as a variety
of subgroups. Concurrent validity, assessed using the Basic School Skills Inventory, was
found to be in the .55 range. The test requires individual administration and takes
approximately 20 minutes to complete. There are currently two forms of this test.
Teacher Letter. A letter to the Head Start teachers was distributed to explain the study.
The classroom teachers assisted in recruitment of preschool children by sharing
information about the study with parents (see Appendix A).
Parent Questionnaire. Accompanying the informed consent form, a parent
questionnaire was distributed to parents of children in the sample population. The
questionnaire inquired as to the reading behaviors of the children at home along with
their access to technology-enhanced interactive literacy toys and other literacy software.
Parents were asked the relative amounts of English and Spanish that are spoken in the
home and the primary language of the parent. Parent questionnaires were sent home in
English and Spanish (see Appendices B, C, & D).
Protocol. A structured protocol was used by the experimenters to ensure the reliability
and validity of results. This protocol included standardized instructions to be read to the
participants along with appropriate ways to react to behaviors such as a lack of interest,
failure to play with the toy following the instructions, or desire to end the session early
(see Appendix E).
Observation Sheet/Fidelity Checklist. An observation coding sheet was used by the
experimenters to support consistent and operationally defined observations of the
interactions. Information regarding the duration of the session, specific books selected,
and other detailed behaviors will be recorded. This form was used by the experimenters
as a fidelity checklist to ensure standardized procedures (see Appendix F).
Procedures
After receiving approval from the Parent Advisory council for the Head Start
program, the participants were recruited from pre-existing classrooms within the district.
After obtaining consent from the parents or guardians, the research began. The parents
were asked to complete a questionnaire regarding literacy skills of their children and
children’s exposure to reading and other literacy toys in the home. The participants were
randomly assigned to the interactive and non-interactive conditions. The TERA:3 was administered to both the experimental group and the control group as a pre-test assessment of literacy skills.

Experimenters were graduate students previously trained in protection of human subjects. They were trained according to the protocol used with the participants. In order to enhance standardization of procedures, all experimenters observed together during the first week of exposure to the toy. All experimenters thoroughly completed the observation sheet/fidelity checklist to ensure all appropriate steps were followed. Additional student assistance was occasionally needed. Experimenters were trained similarly on protocol use and observation recording. They attended IRB training and used the methods outlined in this proposal.

During the exposure phase, participants in the technology condition had controlled exposure to the Power Touch™ toy, beginning with training from the experimenters. Each child in the experimental group was individually removed from his/her classroom for one 25-minute session twice per week for six to twelve weeks. During the session, the experimenter spent five minutes at the start of the session interacting with the child, according to the protocol, while using and introducing the PowerTouch™ toy. During the next twenty minutes, the child received no interaction from the experimenter and was observed playing with the interactive toy. Protocol was followed as to standardized responses to questions from the children. On the occasion that the child wanted to stop playing with the interactive toy prior to the end of the session, the experimenter provided one prompt. If the child still wished to end the session, they were allowed to return to their classroom (see Appendix E).

Participants in the books only condition were exposed to the books without the interactive base for the same amount of time per week and with the five minutes of interactions and twenty minutes of solitary involvement with the books. Similar procedures were used according to the protocol.

At the end of the six to twelve week period, the TERA:3 was re-administered as a post test to both experimental conditions.

Throughout the study, human subjects were protected. A parental consent form,
including an experimental disclosure explaining potential risks, was used to assure informed consent and allow the parents a choice in their child’s participation. No deception was involved and the potential risk of detriment to the child due to missed class time was minimized, for both the experimental conditions, by the additional practice of literacy skills occurring during research sessions. To compensate with any gains made solely by the interactive participants, a PowerTouch™ Learning system was donated to each participating classroom upon completion of the study.

Further participant protection in the form of confidentiality was maintained throughout the experiment. Participant names were not included on any data recordings, but rather a participant number corresponding to the number heading their signed consent form identified them. These forms were stored separately from all experimental data. Additionally, the children themselves were asked for verbal assent for their participation, assuring that their rights were protected and they were not hostile participants.

Data Analysis

To analyze the data collected, a series of ANCOVA analyses were used. The overall differences in boys and girls was measured and evaluated for statistical significance. The structured observations were quantified and used to make correlations as to time spent with the toy and storybook choice. Several analyses were made to compare the results for boys and girls. All hypothesized relationships were analyzed with a Pierson t-test. Probability was set at the .05 significance level.
Chapter IV: Results

The expectation was that the interactive and dynamic qualities of the PowerTouch™ Learning System would allow children to work independently, at their own rate, on the emergent skills and vocabulary acquisition necessary for their success with literacy. The pre- and post-test data results were compared using a series of ANCOVA analyses after final sample size and homogeneity were established, to examine the differences in the mean performance on the TERA:3 post-test between experimental groups. Probability was set at the .05 significance level.

Hypothesis one: There will be a difference in TERA:3 scores between participants in the technology condition and participants in the books only (control) condition.

Although the results were not significant, the means for the two groups did differ. The TERA:3 scores of the participants in the technology group were higher than those of the participants in the books only group ($M_{technology} = 91.28; M_{books only} = 86.48$), $F(1,40) = 0.96$, $p = .335$. (See Table 4.1).

Table 4.1
TERA:3 Reading Quotient pre-test descriptive statistics between experimental condition

<table>
<thead>
<tr>
<th>Experimental Condition</th>
<th>$M$</th>
<th>$SD$</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>84.22</td>
<td>8.07</td>
<td>18</td>
</tr>
<tr>
<td>Books Only</td>
<td>81.78</td>
<td>11.93</td>
<td>23</td>
</tr>
</tbody>
</table>

TERA:3 Reading Quotient post-test descriptive statistics between experimental condition

<table>
<thead>
<tr>
<th>Experimental Condition</th>
<th>$M$</th>
<th>$SD$</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>91.28</td>
<td>12.07</td>
<td>18</td>
</tr>
<tr>
<td>Books Only</td>
<td>86.48</td>
<td>13.76</td>
<td>23</td>
</tr>
</tbody>
</table>
Hypothesis two: There will be a difference in the amount of time spent in experimental sessions between participants in the technology condition and participants in the books only condition.

Overall, there was a greater amount of time spent engaged in literacy activities during experimental conditions by the technology group than the books only group. The technology group spent a total of 87.28 minutes, while the books only group spent 35.96 minutes \((F(1,40)=35.45, p=.001)\). A large effect size (.518) was found.

Hypothesis three: After exposure to the Power Touch\textsuperscript{TM}, both boys and girls will gain literacy skills.

To test this hypothesis a “gain” score was calculated. Although both boys and girls did show a gain in literacy skills after exposure to the Power Touch\textsuperscript{TM}, gains were not statistically significantly higher than those made by the control group. The overall gain made was approximately 5.8 points on the TERA:3.

Although the differences in gains made between experimental conditions were not statistically significantly, it should be noted that girls performed better on the TERA:3 than boys in the books only condition \((M_{\text{boys}}=84.11, M_{\text{girls}}=88.00)\), while boys performed better than girls in the technology condition \((M_{\text{boys}}=92.29, M_{\text{girls}}=90.64)\). This information suggests that boys showed greater differences in literacy skills than girls between experimental conditions.

Hypothesis four: There will be a larger gain in literacy skills for girls than boys.

In regards to the entire sample combined, girls did show slightly higher gains in literacy skills measured by the TERA:3, however this difference was not statistically significant, \((M_{\text{boys}}=84.11, M_{\text{girls}}=88.00), F(1,40)=.556, p=.58.\) (See Table 4.2)
Table 4.2
*TERA:3 Reading Quotient Pre-test Descriptive Statistics by Gender and Experimental Condition*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Whole Sample</th>
<th>Technology Group</th>
<th>Books Only Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Boys</td>
<td>81.31</td>
<td>8.40</td>
<td>82.29</td>
</tr>
<tr>
<td>Girls</td>
<td>83.84</td>
<td>11.51</td>
<td>85.45</td>
</tr>
</tbody>
</table>

*TERA:3 Reading Quotient Post-test Descriptive Statistics by Gender and Experimental Condition*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Whole Sample</th>
<th>Technology Group</th>
<th>Books Only Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Boys</td>
<td>87.69</td>
<td>13.18</td>
<td>92.29</td>
</tr>
<tr>
<td>Girls</td>
<td>89.16</td>
<td>13.30</td>
<td>90.64</td>
</tr>
</tbody>
</table>

*Hypothesis five: There will be a difference in duration of time spent using the interactive, technology-enhanced toys between boys and girls.*

Results indicate that the total number of minutes spent engaged in the literacy activities was higher for girls (66.6 minutes, n=25) than for boys (50.125 minutes, n=16), (F(1,40)=3.872, p=.06). This difference approached significance.
Hypothesis six: *There will be a relationship between time spent in experimental sessions and gains made in literacy skills.*

There was expected to be a relationship between the amount of time spent in the experimental conditions and the post-test scores on the TERA:3. There was not found to be a significant difference in the post-test TERA:3 Reading Quotient scores between subjects depending on the amount of time spent in session, $F(1,40)= 0.60, p=.446$.

Hypothesis seven: *There will be a relationship between time spent engaged in literacy related activities at home, as reported by parents, and gender of the child.*

Minutes spent engaged in literacy related activities were reported in categories. A Chi-square analysis was used to investigate the relationship between number of minutes spent engaged in literacy related activities and gender of the child. No significant differences were found. There were, however, significant differences in the gender distribution of the parent engaging in those literacy related activities. According to parent report, mothers read to both girls and boys significantly more than fathers. No fathers were reported to read to girls ($\chi^2= 6.745, df=1, p=.05$).

*Post hoc Results*

Observational data indicate there were differences in participants’ behavior during experimental sessions. During both of the experimental conditions, various degrees of “reading acts” were defined and observed. The frequency of each of these reading acts were recorded during each of the six sessions. Actions were coded into four activities, described as Reading Act 1, Reading Act 2, Reading Act 3, and Reading Act 4. Reading Act 1 was defined as the subject physically orientated towards the materials, turning pages, and/or touching items on the system or the books. Reading Act 2 was defined as the subject pointing to and verbally naming pictures, letters, or words on the system or books. Reading Act 3 was defined as the subject running their finger along the words of the story in the correct order (on the books alone or with the interactive base), telling the story, inventing a story for the pictures while turning the pages, or in some way demonstrating an awareness of the existence of a story as it relates to a book. Reading Act 4 was defined as “other”, non-reading activities. The three categories that relate to reading activities (1, 2, and 3) were compared. Reading Act 1 is considered a more basic pre-literacy skill: Reading Acts 2 and 3 are considered to be increasingly more complex.
respectively. Figure 4.3 illustrates the larger percentages of higher order reading acts in the books only condition compared to the technology condition (See Figure 4.3). The difference between experimental conditions engaged in Reading Act 1 was significant \((F(1,40)=12.55, p=.001)\). Differences in Reading Act 2 between experimental conditions were also significant \((F(1,40)=8.97, p=.005)\). The more frequent occurrence of Reading Acts 2 and 3 in the books only condition may contribute to the lack of expected effects on pre-literacy skills (as measured by the TERA:3) of the technology condition. This data will be further addressed in the discussion section of this document.

Figure 4.3  Time spent in reading acts by experimental condition.

Further analyses of the Reading Act data indicate a difference in time spent engaged in each act between boys and girls. When the data is broken down by experimental condition and gender, significance is found for Reading Act 3, the most complex of the Reading Acts observed, in the books only condition (Refer to Figure 4.4). Female subjects in the books only condition spent more time on average engaging in
Reading Act 3 than did their male counterparts (M_females= 8.75; M_males= 0.93), F(1,40)=6.37, p=.016.

*Figure 4.4.* Percent of time spent in reading acts by experimental condition and gender.

---

In addition to the overall Reading Quotient of the TERA:3, individual subtest scores were analyzed. Each subtest of the TERA:3 measures different aspects of literacy development. Subtest 1 assesses a child’s knowledge and use of the alphabet and letter-number differentiation. Subtest 2 of the TERA:3 assesses a child’s knowledge of conventions of print, or the arbitrary aspects of English print (e.g., the direction in which print is read, how to hold a book, and when to turn a page). Subtest 3 measures a wide variety of ways in which a child comprehends print (e.g., signs, logos, and print).
Although there were differences in subtest scores as they relate to gender and experimental condition, none of the differences were significant (See Figure 4.5).

*Figure 4.5.* Post Subtest descriptive statistics by gender and experimental condition.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Subtest</th>
<th>Technology</th>
<th>Books Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>BOYS</td>
<td>Subtest 1</td>
<td>9.00</td>
<td>1.83</td>
</tr>
<tr>
<td></td>
<td>Subtest 2</td>
<td>8.28</td>
<td>2.43</td>
</tr>
<tr>
<td></td>
<td>Subtest 3</td>
<td>9.14</td>
<td>2.85</td>
</tr>
<tr>
<td>GIRLS</td>
<td>Subtest 1</td>
<td>8.36</td>
<td>2.87</td>
</tr>
<tr>
<td></td>
<td>Subtest 2</td>
<td>8.09</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>Subtest 3</td>
<td>9.18</td>
<td>2.04</td>
</tr>
</tbody>
</table>

A final post hoc item to be discussed relates to the correlation between the time spent engaged in literacy related activities at home, as reported by parents on the parent survey, and the time spent in the experimental sessions. Results approached significance and indicate that the more time a participant spent engaged in literacy related activities at home, the more time they spent engaged in literacy related activities in the experimental session (pearson 2-tailed, $r = .592$, $p = .084$).
Chapter V: Discussion

This final chapter discusses the previously described research. Findings that support contemporary literature are reviewed. Additional findings (post hoc results) are discussed. Limitations of the research as well as recommendations for future research are described. Finally, conclusions and summary comments are made.

Study Design Based on Contemporary Literature

A review of the literature suggested a significant disparity between boys and girls in relation to emerging literacy skills, with girls typically demonstrating emerging literacy skills more than boys. This research does show that on the TERA:3, girls scored higher on average, however these results were not significant. However, when the time spent engaged in various degrees of reading (Reading Act 1, 2, and 3) were analyzed, girls spent a significantly more amount of time engaged in the most complex level of reading behavior (Reading Act 3). This increased amount of time demonstrating an awareness of a story as it relates to a book may reflect the disparity between genders of emerging literacy skills.

The literature proposed that female adults, on average, spend more time engaged in literacy activities with children than male adults. Results from the parent survey (see Appendix D) support this finding. According to parent report, mothers read to both girls and boys significantly more than fathers. In fact, no fathers included in this sample were reported to read to girls. The increased exposure to female models of readers may additionally influence the perceptions of young children as to gender appropriate activities.

A review of the literature also suggested that girls were found to be less likely to work or play with technology-enhanced toys when allowed. The data from this study do not support this finding. There were no significant differences in gender as it related to time spent engaged within the technology condition. However, the difference in literacy gains among boys and girls between experimental conditions is noteworthy. In the books only condition, girls performed better than boys on the TERA:3, while in the technology condition, boys outperformed girls. The increased gains in literacy skills displayed by
boys in the technology condition, as measured by the TERA:3, may have been influenced by a higher level of interest in technology-enhanced toys on behalf of the boys.

Additional Findings

Post hoc results indicate that participants in the books only condition engaged in more advanced "reading acts" than those in the technology condition. Preschool students working with the books alone were more engaged in more complex behaviors, indicating an awareness of a story as it relates to a book. These findings suggest that participants in the books only condition engaged in higher levels of literacy development than those in the technology condition. These differences in complexity of engagement may have contributed to the lack of expected effects on pre-literacy development (as measured by the TERA:3) of the technology condition. Had the participants in the technology condition been engaged at a level similar to those participants in the books only condition (as indicated by a higher percentage of time spent in higher order reading acts), results may have indicated a more significant difference in pre-literacy development between conditions. This lack of engagement in the highest order of reading acts may have been influenced by the age of participants and internal quality of the technology used in this study. Limitations regarding age of participants and the Power Touch™ in terms of it qualifying as a "technology enhanced" literacy toy will be discussed further.

Limitations

The first, and most significant, limitation to this research relates to attrition of participants due to the loss of transportation. During the last week of data collection, public bussing was unavailable to all children attending Head Start classrooms in the region in which the research took place. Nineteen participants from the original sample of 60 were lost from the population. Although pre-test data and experimental data had been collected for these participants, post-test information was unable to be assessed. This dramatic decrease in sample size surely impacted the results presented in this research. Additionally, the loss of participants also contributed to an imbalance of the number of participants in each experimental condition.

More than half of the children overall (52.3%) spent less than half the time available in session. This may have been influenced by two factors. The first involves the
structure of the experimental sessions. The experimental sessions were divided into six, twenty-minute sessions. These sessions may not have been an appropriate length of time for the children involved in the study. Many of the children lost interest in both the interactive, technology-enhanced toy as well as the books due to the lengthy session time. A second factor that may have influenced the lack of engagement for the entire session time may have been due to other classroom or student variables. Students may have been more or less willing to remain in session based on what was going on in the classroom when they were removed. For example, if a participant enjoyed playing outside and their session happened to occur during outside time, they may have been more likely to request to leave the session prior to the scheduled ending of the session. Additionally, other student factors such as illness may have contributed to session length.

Similarly, the ages of children included in the sample may not have been appropriate for the skills addressed in the Power Touch™. The interactive base provided letter naming and other pre-literacy based features, however when books were added, numerous games and activities were offered. The existence of these games and activities along with the manner in which they were to be played may have been overwhelming and confusing for the participants in the study. Due to the young age of participants included in this study, some of the skills addressed in the Power Touch™ may require prerequisite literacy skills not yet developed with the sample population. Older children may better understand the games and features included on the Power Touch™ and therefore be more successful in manipulating and accessing the toy in general.

Due to graduate student availability and gender make-up, this research included exclusively female examiners. As one of the purposes of this research was to examine gender as it relates to literacy development, it would have been beneficial to include male examiners during the experimental sessions. Further investigation may then have been done as to the time spent and gains made with male versus female examiners.

The external validity of the Power Touch™ was questionable in terms of including the components previously discussed in terms of qualifying as a “technology-enhanced” literacy toy. As discussed in the review of literature, many technology-enhanced literacy toys utilize “finger point reading”. This technique synchronizes computerized vocalizations with individual printed words. This voice-to-print match is
intended to improve vocabulary acquisition and phoneme segmentation (Uhry, 2002). The vocalizations provided on the Power Touch™, however, do not always correspond with the item represented in the picture provided, and may instead refer to a characteristic of that item (e.g., if a child points to red ball, the computerized vocalization may state “red” instead of “ball”).

Due to the analog nature of this research, participants were potentially impacted by the design and structure of the experimental sessions. Removal from the natural environment (i.e., classroom) may have created inflated novelty responses due to researchers and toys not typically existing in the classroom. The lack of choice in the timing of sessions may also have altered the interest level, motivation, and the comfort level of the participants.

Finally, the sample used in this research, although ethnically diverse in nature, was not balanced in terms of socioeconomic status. All of the participants came from a local Head Start preschool classroom. Enrollment requirements for Head Start include a reduced income level relative to national averages. Findings from this research cannot completely generalize to the general preschool population.

Recommendations for Future Research

When conducting similar research with preschool children, adjusting the structure of the experimental sessions may assist in engaging preschool participants for longer overall amounts of time. As mentioned before, the lengthy nature of the experimental sessions of the current research may have contributed to the abbreviated engagement of the participants. Having 12, ten minute sessions rather than six, twenty minute sessions may extend the total amount of time preschool children remain engaged with similar toys. Additionally, structuring the sessions to occur at the same time of the day may eliminate variations on what the students were missing from their daily classroom routines.

As mentioned previously in the limitations of the current research, the ages of the participants may not have been appropriate for the technology-enhanced toy used in the current research. Future research with similar technology-enhanced toys may be better suited for older participants, perhaps 5 or 6-year olds.

In addition to the advanced nature of the games and activities included on the Power Touch™ system, it may have been more appropriate to provide the preschool
children with an extended “exploratory” period, in which various features and “rules for play” could be explored and better understood. A longer and more thorough instructional vignette may have better prepared the participants for experimental sessions. This also would have reduced some of the novelty effects previously discussed.

Conclusions and Summary

The current research examined the gender differences in literacy development for boys and girls who use the PowerTouch™ interactive toy in Head Start preschool classrooms. Research purpose and procedure were well organized and thoroughly planned. Data collection proceeded as planned, with the exception of the attrition of participants due to loss of transportation. Although several results related to proposed hypotheses were not found to be significant, subjects were found to spend more time with the interactive technology-enhanced toy. Additionally, post-hoc analyses revealed that when participating in the books-only condition, girls spent more time engaged in higher levels of the reading act. The findings of this study contribute to the field of human learning and, more specifically, knowledge regarding literacy skill development.
References


Appendix A

Teachers:

Hello! We are second year school psychology graduate students at Miami University in Oxford, Ohio. We are writing to inform you of a research study that we are conducting for our theses and ask for your assistance in this study.

About the Study

The study is entitled “The Effect of the PowerTouch™ Learning System on Emergent Literacy Skills”. The purpose of the study is to determine if the use of the PowerTouch™ Learning system impacts emergent literacy skills in preschool children. The study will examine if using the PowerTouch™ Learning system will increase letter knowledge, print awareness, and language acquisition in 60 typically developing preschool children.

The study will be conducted in from September 2004 through February 2005 in three phases: pretest (where children with signed parental consent are administered the TERA-3), individual sessions (where the children are given the PowerTouch™ Learning system or PowerTouch™ books alone and interactions are observed), and the post-test (where the TERA-3 is readministered). It will be primarily conducted by three School Psychology graduate students. Approximately twice a week, for 25 minutes each session, the researchers will present the PowerTouch™ Learning system or books to the child and observe the child’s interactions with it. The researchers will be observing and recording the child’s engagement in the literacy activities provided by the PowerTouch™.

Why you should help?

Emergent literacy skills can serve as predictors of later reading ability. Technology enhanced toys are often being promoted as literacy tools. This study is valuable because it will provide educators with information regarding the effect of technology enhanced toys on the promotion of greater early literacy skills. The knowledge gained from this study will also be helpful in determining useful literacy tools for children and their families at home. In addition, all participating classrooms will receive a PowerTouch™ Learning System upon completion of the study.

How you can help?

Please inform families about the study and its importance. You will be given parent forms for children’s participation in the study. When a parent/caregiver is interested, have the parent read the parent letter, complete the Parent Questionnaire, and sign the permission form. Finally, please submit both completed forms to us by placing them in _____________ mailbox.

Thank you for your time. If you have any questions, please contact us at (513) 529-8051 or at wilsonj8@muohio.edu or Dr. Doris Bergen at Miami University at bergend@muohio.edu.

For questions regarding this study’s compliance with the protection of human subjects and participant rights, you can contact the Office for the Advancement of Research and Scholarship: (513) 529-3734. We appreciate your willingness and look forward to working with you.

Sincerely,
Judith Wilson, M.S., Deanna Strigens, M.S., Sara Michelucci Vondracek, M.S.
Appendix B

Dear Parent:

The Fisher Price toy company, which makes the PowerTouch™ Learning System, has donated 20 PowerTouch™ toys to us to do a study on early reading skills in Head Start children. The PowerTouch™ is a toy with books to insert, so a child can touch the pages, and the toy “reads” the words and sounds out loud. This means preschool children can learn about reading by reading a book on their own.

We want to find out more about how these toys can help young children learn to read. We hope you allow your child to join this study because it will help us to learn more about how these types of toys might help children get the strong base in reading that they need to succeed.

If you agree to let your child join the study, you will also be asked to answer some questions about your child’s reading and use of reading toys at home. It will also ask about the main language spoken in your home. A reading skills test will be given to your child before and after the study. This test will allow us to see what reading skills your child has gained during the study. Your child may work with the PowerTouch™ toy and books or with PowerTouch™ books alone.

Your child will play with the toy or books in about two 25 minute sessions per week over six to twelve weeks starting in October. During each session, they will spend some time learning how to use the PowerTouch™ toy or books, and for the rest of the time they will play on their own with the item. At the end of the study, your child will take the test again.

There is no risk to your child; if your child does not want to be in the study or wants to stop at any time, s/he is free to do so. Please return the questionnaire with the signed permission slip to your child’s teacher. We really hope you will let your child participate in this important study.

Anything you share about your child will be confidential and your child’s name will not be in the results. If you have any questions about the study, please call Deanna, Sara, or Judith at (513) 529-0851 or Dr. Doris Bergen at 513-529-6622. If you have questions on human subjects’ protection, please contact the Miami Research Office, 513-529-3734. We appreciate your help.

Sincerely,

Deanna Strigens, M.S.
Sara Michelucci Vondracek, M.S.
Judith Wilson, M.S.
Appendix C

Permission Slip

I understand the purpose of the PowerTouch™ study being conducted by Deanna Strigens, Sara Michelucci Vondracek, and Judith Wilson, of Miami University and agree to let my child (name)__________________ participate in the study, if s/he is willing to do so. I understand that the study will be at my child’s preschool and that my child will spend six sessions of about 25 minutes playing with a PowerTouch™ learning system or PowerTouch™ books. I also understand that my child will be given a pre- and post-test on reading skills, and be observed at play. I agree to answer some questions about my child’s usual at home reading and language(s). I understand the study will protect my child’s privacy and nothing will be reported that will identify my child. I also know my child can choose not to be in the study or can stop at any time with no penalty for either me or my child.

Parent Signature_________________
Parent Address____________________

Parent Phone Number_____________________
Child Birthdate____________________

Number____________
Appendix D

Miami University
School Psychology Program
Judith Wilson, Deanna Strigens,
Sara Michelucci Vondracek, Principal Investigators
Phone: (513) 529-8051

Dear Parents:
We are interested in knowing about literacy activities in your home. There are no right or wrong answers. Your answers will help us to better understand the development of early literacy skills in children. Please answer all of the questions on this questionnaire.

Parent’s Name __________________________  Phone Number ____________
Child’s Name ___________________________
------------------------------------------------------------------------------------------------------------
Child’s Date of Birth _____________            Gender: ______ Male    _____Female

1. Approximately, how many times minutes per day do you or another adult at home read with your child? (Circle one)
   0-10   11-20   21-30   31-40   more than 40 minutes
2. Is the person who does most of the reading with your child:
   ___  Male   ___  Female
3. Please check any of the following that you may have in your home:
   ___  Leap Pad
   ___  Fisher Price Power Touch
   ___ Educational phonics or reading computer software
   ___ Other:  __________________
   ___ None of the above
4. Has your child used one of the toys mentioned in question 3 during the past month?
   Yes    No
   If so, how often?
   1-2 times a week 3-5 times a week Daily
5. What language is primarily spoken in your home?
   Spanish  English  Other__________
6. In what language do most reading activities occur in your home?
   Spanish  English  Other__________
7. Is a second language used in your home regularly?
   Spanish  English  Other__________  None
8. Does your child have any known history of speech, language, or motor difficulties? If yes, please specify the difficulty.

Thank you for completing this questionnaire.
If you have any questions about this questionnaire, please contact us at (513) 529-8051.

Number: ________
Appendix E

Interactive Session Protocol
Possible duration 25 minutes.

1. The PowerTouch™ is turned on and opened. Stopwatch/watch ready.

2. Mark start time.

3. Give session instructions: “Today we will be reading (insert book name or offer choice of book). You can read the story using your finger to underline the words (demonstrate so child can see) like this, or you can read each word (touch word to demonstrate) like this, or you can touch things to find out their name (demonstrate) like this. You can learn letter sounds by first pressing here, then each letter (demonstrate) like this. You can read by yourself now. Let me know if you need help.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you read more of your book?”

6. The examiner will make observations on provided observation sheet.

7. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

8. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you spend a little more time reading the books?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

9. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Non-interactive Session Protocol
Possible duration 25 minutes.

1. The book is out and opened. Stopwatch/watch ready.

2. Mark start time.

3. Give session instructions: “Today we will be reading (insert book name or offer choice of book). You can read the story using your finger to underline the words (demonstrate so child can see) like this, or you can read each word (touch word to demonstrate) like this, or you can the names of things (demonstrate) by looking here. You can also practice letter sounds (demonstrate). You can read by yourself now. Let me know if you need help.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you work more on your PowerTouch™ book?”

6. The examiner will make observations on provided observation sheet.

7. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

8. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you read some more?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

9. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Interactive Training Session Protocol
Duration 25 minutes. Examiner introductions will occur during class time.

1. Examiner goes to classroom to retrieve student: “It’s your turn today to come with me to do some reading, okay?”

2. Explain experiment: “I am a graduate student from Miami University, and I and two others are studying how different things help kids learn to read. Would you like to help with that? ... Once a week, one of us will get you from your classroom and spend about half an hour practicing reading. Today I am going to show you how we do that.”

3. Demonstrate PowerTouch™: “We’re going to use this book to help read. When you put a book in it, you can read the story using your finger to underline the words (demonstrate so child can see) like this, now you try it. You can read each word (touch word to demonstrate) like this, now you try. Or, you can touch things to find out their name (demonstrate) like this, can you do it? You can also learn letter sounds by first pressing here, then each letter (demonstrate) like this. You try. Now I’m going to let you play with it for a while. Go ahead.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you read more with your book?”

6. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

7. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you practice reading some more?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

8. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Non-interactive Training Session Protocol
Duration 25 minutes. Examiner introductions will occur during class time.

1. Examiner goes to classroom to retrieve student: “It’s your turn today to come with me to do some reading, okay?”

2. Explain experiment: “I am a graduate student from Miami University, and I and two others are studying how different things help kids learn to read. Would you like to help with that? ... Once a week, one of us will get you from your classroom and spend about half an hour practicing reading. Today I am going to show you how we do that.”

3. Demonstrate PowerTouch™ books: “We’re going to use these books to help learn to read. You can read the story using your finger to underline the words (demonstrate so child can see) like this, now you try. You can read each word (touch word to demonstrate) like this, you try. Or you can find the names of things (demonstrate) by looking here, can you see that? You can also practice letter sounds. Now I’m going to let you play with it for a while. Go ahead.”

4. Examiner may respond to questions concerning the instructions by repeating any portion of the instructions as many times as necessary.

5. Examiner may respond to other questions, personal, conversational, or other, by saying, “Right now we’re learning reading, why don’t you read more of your book?”

6. If child requests a bathroom break, examiner will mark the time, take the child, and mark the time when returned. The duration of the break will be added on to the end of the session to allow the full twenty-five minutes.

7. If the child indicates s/he is finished the examiner may prompt with, “Why don’t you practice reading some more?” If the child again indicates s/he is finished, the examiner will mark the end time and return the child to the classroom.

8. If the time reaches twenty-five minutes before the child is finished, say: “We’re all done for today. You can stop there,” and return the child to the classroom.
Appendix F
Observation Sheet/Fidelity Checklist

___ Child observed is part of sample population

___ Child is observed by trained observer

___ Child is observed in secluded area, away from distraction

___ Observer interacts with child for five minutes at the start of the session

___ Observer follows protocol for any unique circumstances/questions from child

___ Observer makes appropriate books available according to session #

Book Schedule
Session 1, 7 = Sesame Street & Ernie
Session 2, 8 = Ernie & Blues Clues
Session 3, 9 = Blues Clues & Clifford
Session 4, 10 = Clifford & Sesame Street
Session 5, 11 = Sesame Street & Ernie
Session 6, 12 = Ernie & Blues Clues

Book(s) selected by child (first=1, second=2):
___ Sesame Street
___ Ernie’s Neighborhood
___ Blues Clues
___ Clifford

Experimental Condition: with PowerTouch™ base without PowerTouch™ base

Subject #:________ Observer name: ______________________________

Session #:_______ Date: _______ Gender of child: _______

Session begin time: _______ Session end time: _______

Did the child wish to terminate the session early: yes no
If yes, what time was the first prompt given? _______
At what time was session terminated? _______

How session ended:
___ child selected to end session following one prompt
___ observer ended session due to time limit
___ other distraction in school ended session (fire alarm, other emergency)
    If so, what distraction ended session: ______________________

Operational Definitions:
Child engagement = Any of the following:
- child face and body oriented toward the PowerTouch™ materials
- child is interacting with or listening to the PowerTouch™ materials
- child is using or participating in one of the PowerTouch™ activities

<table>
<thead>
<tr>
<th>Interval # (1 minute duration per interval)</th>
<th>Reading aloud</th>
<th>Using of book E= Ernie C=Clifford S=Sesame Street B=Blues Clues</th>
<th>Child engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES: